PATENT SPECIFICATION (11) 1 367 276

1 367 276

(21) Application No. 17593/73 (22) Filed 12 April 1973 (19)
(31) Convention Application No. P 22 21 377.0
(32) Filed 2 May 1972 in
(33) Germany (DT)
(44) Complete Specification published 18 Sept. 1974
(51) International Classification G01N 1/14
(52) Index at acceptance
B8N 10

(54) APPARATUS FOR DRAWING DISCRETE SAMPLES OF WATER

(71) We, HAGENUK VORMALS NEUFELDT & KUHNKE G.m.b.H. of 431 Westring, Kiel, Germany, a Joint-Stock Company organised under the laws of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus for drawing one or more samples of water at selective time intervals, more particularly for the purpose of inspecting waters in order to detect impurities by means of appliances equipped with sample tanks, which are used on buoys, bottom structures, piles or the like.

By means of measured value transducers, for example conductivity probes, oxygen probes, pH value probes or turbidity meters, it is possible, when a pre-determined value is exceeded or by an internal time control system, to draw from the waters to be inspected, by using the said apparatus, samples of water which are passed for examination by chemical analysis.

The invention aims at producing an apparatus which is capable of collecting a number of samples in water in response to a speific command, without the possibility of a disadvantageous deterioration of the samples contained in the sample vessel occurring after the sample has been drawn.

To this end, the present invention consists in an apparatus for drawing discrete samples from water, comprising a housing, a plurality of sample vessels or ampoules arranged in said housing, the inlet of each sample vessel or ampoule being connected to one end of a hoseline containing a filter the other end of which hoseline is connected to one end of a capillary tube which is sealed at its other end, each sample vessel, hoseline and capillary tube being evacuated and said capillary tubes being mounted in a closure member in holes concentrically arranged and equiangularly spaced around an axis, and a shear arm driven by a stepping motor for rotation about said axis whereby consecutively to shear off the sealed ends of the capillary tubes to allow water to be sucked into the evacuated sample vessels or ampoules.

In comparison with the hitherto known water samplers, which are opened and closed by a mechanism requiring intensive maintenance—e.g. by drop weights, the apparatus of the present invention requires only a sealed capillary tube to be cut off by a shear arm. By virtue of this advantageous construction of the invention it is possible in practice to accommodate any desired number of previously evacuated sample vessels or ampoules in a single magazine. By virtue of the construction of the invention it is possible to eliminate the expensive and complicated opening and closing mechanism of the known samplers. By using a chemically inert material for the sample vessels or ampoules, preferably glass, the sample of water drawn can be stored in the vessel or ampoule for any desired period. The operation of shearing one or more inlet capillaries can be tripped by criteria, measurable by physical means, of a variation in the water to be inspected, or by a time interval switch.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example, one embodiment thereof, and in which:—

Fig. 1 is an axial section of the apparatus;

Fig. 2 is an end view in the direction of the arrow "A" on Fig. 1;

Fig. 3 is a sectional view of the detail "B" of Fig. 1 drawn on a larger scale; and

Fig. 4 is an electric circuit diagram.

In the housing 1 of a sampler apparatus, a plurality of previously evacuated sample vessels or ampoules 2 made of glass are stored protected from shocks in a magazine 3 preferably of resilient foamed plastics. An inlet aperture 4 of each sample vessel 2 is passed through a vacuum hoseline 5 having a membrane filter 6 inserted therein which are connected at their ends to fused glass inlet capillaries 7, supported in a closure piece 8. The closure piece contains concentric bores 9 at uniform intervals, corresponding to the number of the inlet capillaries 7, through which the ends of the

inlet capillaries 7 are passed. The inlet capillaries 7 retained in this manner protrude by their closed ends through the closure piece 8 sufficiently to permit a shear arm 11 controlled by an impulse controlled stepping motor 10 to shear off the inlet capillaries 7 of the sample vessels 2 consecutively for the purpose of drawing samples from the water in which the device is submerged. In order to ensure that the sheared inlet capillaries 7 are broken off neatly, the latter are provided with a weakening at 7*a* at the appropriate positions, for example with an ampoule saw.

The drive of the shear arm 11 is effected by the impulse controlled stepping motor 10 via a shaft 24, the total rotation angle of 360° of which is divided into steps of e.g. 2°—i.e. the shaft executes one revolution when the motor is controlled by 180 impulses. A sub-division into steps of 1° can also be provided if required. By using a stepping motor 10, instead of a normal direct current motor, a pre-determined angle of rotation of the shear 11 is ensured.

Control is effected through an impulse generator 12 with a power amplifier 13. The impulses generated by the impulse generator 12 are counted in a counter stage 14. It is possible to perform a preselection of the counter steps for any desired equipment of the magazine with sample vessels. The counter stage 14 switches off the impulse generator 12 after the pre-selected number of impulses has been generated. The impulse generator 12 is switched on by a parameter measurable by water inspection, for example by conductivity probes 15, oxygen probes 16, turbidity meters 17, pH value probes 18 or the like, or by a time-delay element 19 with divider stage 20 and interval preselector switch 21, or by an electric signal generated in any desired manner and necessary for switching on. If samplings are obtained by an electrical remote tripping, the time basis must be maintained. For this purpose the time delay element 19 is used which together with the time marking device 22 ensures a timid arrangement of the sampling.

It is also possible by means of a programme switch 23 to operate a plurality of sampler devices, which may be located in equal or different depths of water, in a series or parallel circuit by a programme switch. The electronic control device and the power supply are accommodated in watertight housings; the stepping motors can likewise be accommodated in watertight housings, or in encapsulated oil filled housings in known manner.

Whether the actual sampler magazine requires protection against pressure depends upon the individual conditions of use.

WHAT WE CLAIM IS: —

1. An apparatus for drawing discrete samples from water, comprising a housing, a plurality of sample vessels or ampoules arranged in said housing, the inlet of each sample vessel or ampoule being connected to one end of a hoseline containing a filter the other end of which hoseline is connected to one end of a capillary tube which is sealed at its other end, each sample vessel, hoseline and capillary tube being evacuated and said capillary tubes being mounted in a closure member in holes concentrically arranged and equi-angularly spaced around an axis, and a shear arm driven by a stepping motor for rotation about said axis whereby consecutively to shear off the sealed ends of the capillary tubes to allow water to be sucked into the evacuated sample vessels or ampoules.

2. An apparatus as claimed in claim 1, wherein the inlet capillary tubes are weakened at the point of shearing by said arm.

3. An apparatus as claimed in claim 1 or 2, wherein the sample vessels or ampoules are supported and protected from shocks in a resilient magazine within said housing.

4. An apparatus as claimed in claim 3, wherein the sample vessels or ampoules are cylindrical.

5. An aparatus as claimed in claims 1 and 3, wherein the stepping motor is a direct current motor which is controlled by an impulse generator with following power amplifier, while the impulses generated by the impulse generator are fed to a counter stage with prescribed counting steps correspondingly to the equipment of the magazine, which switches off the impulse generator after the previously counted impulses have been delivered.

6. An aparatus as claimed in claim 5, wherein the impulse generator is switched on by a time-delay element with interval preselector switch.

7. An apparatus as claimed in claims 5 and 6, wherein the impulse generator is controlled by an externally applied signal.

8. An apparatus as claimed in claim 5 as appendant to claim 3, or in claims 6 and 7, wherein a plurality of sample magazines are controlled both in series and in parallel by a programme switch.

9. An apparatus for drawing discrete samples from water substantially as hereindescribed and as shown in the accompanying drawings.

VENNER, SHIPLEY & CO.,
Chartered Patent Agents,
Rugby Chambers,
2 Rugby Street,
London, W.C.1.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1367276 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

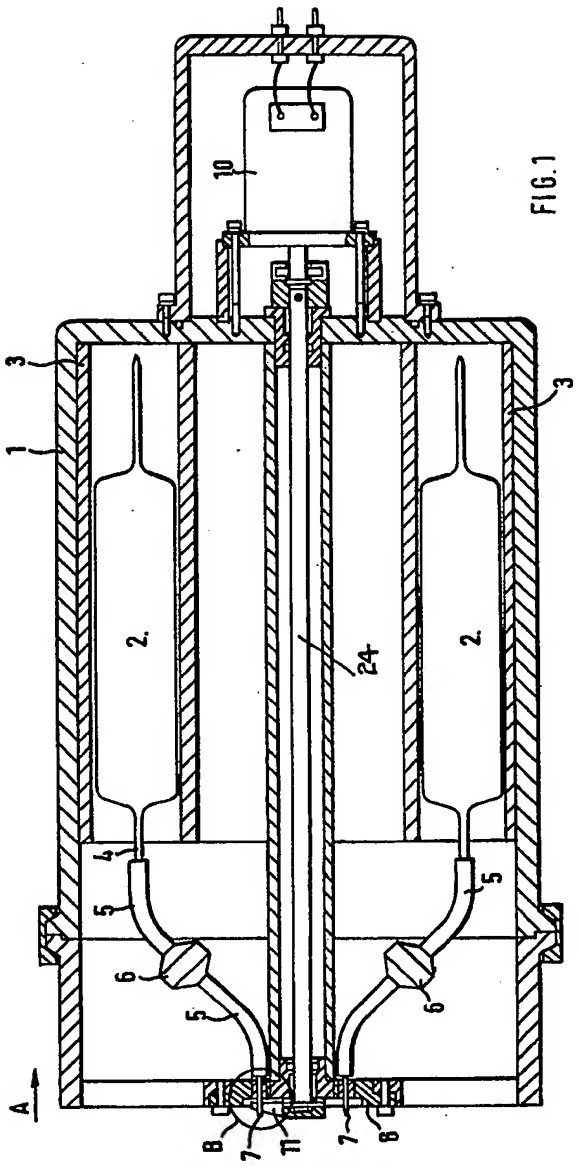

FIG.1

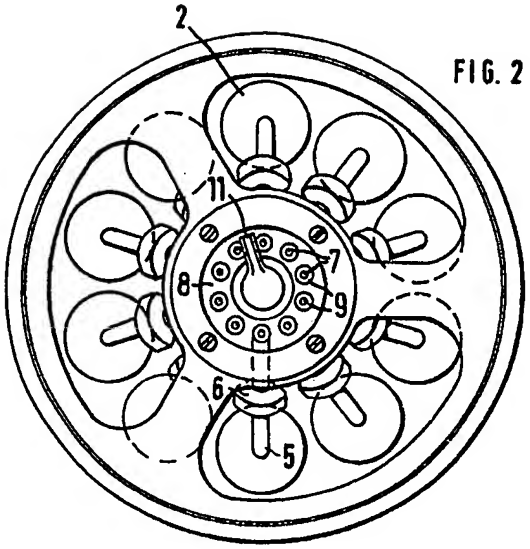

FIG. 2

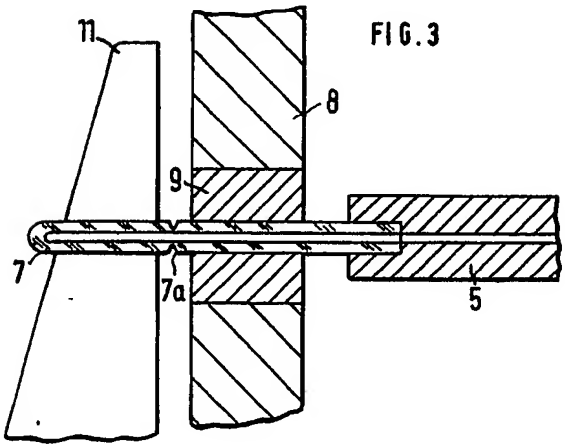

FIG. 3

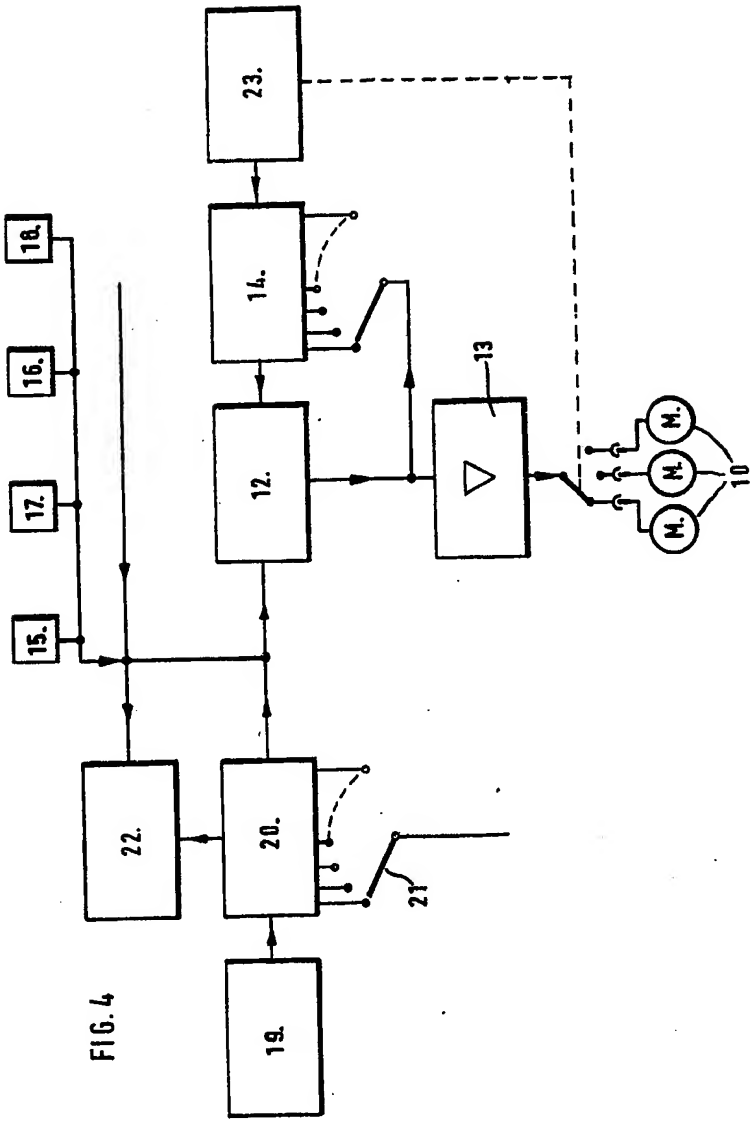

FIG. 4